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CR - 138298

INVESTIGATION OF SKYLAB DATA

EREP No. 472-2

April 1974

NASA 9-13332

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Monthly Plans and Progress Report

(E74-10549) INVESTIGATION OF SKYLAB DATA
Monthly Plans and Progress Report, Apr.
1974 (Michigan State Univ.) 4 p HC
\$4.00
CSCL 05B

G3/13
Unclas
00549

N74-25865

Contract NAS 9-13332

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Mr. Bassey Ekong of our team has been developing estimates of the relationship between costs and errors for the current techniques of the U.S. Department of Agriculture. In the following paragraphs he reports three tables and their derivation. These refer to two sampling designs that may be used in estimation. One is a multiple frame sample design, the other is a standard area sampling technique. The errors refer, technically, to the average error for major crops. They are not standard errors (in a statistical sense) but can be converted to standard errors. The typical error for individual crops varies depending on the total acreage of the crop, its geographical concentration and similar factors.

The Hayami-Peterson article "Social Returns to Public Information Services, Statistical Reporting of U.S. Farm Commodities", (American Economic Review, Vol. LXII, No. 1, March 1972) succeeded in linking costs to efficiency levels or error levels of sample surveys conducted by the Statistical Reporting Services of the U.S.D.A. Based on the 1967 prices, the article related error levels ranging from zero to 3 percent to requisite costs. Below 2 percent error levels, cost differentials between the area sample and multiple frame sample techniques were real while they are indistinguishable between the two techniques at error levels above 2 percent.

On the basis of the Hayami-Peterson data, Mr. Kibler of the S.R.S. (Washington, D.C.) extrapolated the costs-error level relationships to 6 percent. Two other diagrams (charts) differentiated the costs due to area sample and multiple sample frames such that below 2 percent error levels, cost differentials become significant. Above 2 percent, the extrapolations indicated uniform costs between the two methods of surveys. What therefore emerged was the retention of Hayami-Peterson data below 3 percent error levels and Kibler extrapolations above 3 percent error levels (see Table 1.).

Table 1. Cost - Error, Relationships for S. R. S. Methods
(data are costs in millions of 1967 \$)

Error levels (percent)	Total probability sample survey		Crop acreage survey	
	Area sample	Multiple frame sample	Area sample	Multiple frame sample
0.0	62.00	44.20	24.80	17.68
0.5	17.10	13.00	6.84	5.20
1.0	7.90	7.60	3.16	3.04
1.5	5.80	5.60	2.32	2.24
2.0	4.13	4.13	1.65	1.65
2.5	3.76	3.76	1.50	1.50
3.0	3.40	3.40	1.36	1.36
3.5	2.90	2.90	1.16	1.16
4.0	2.40	2.40	0.96	0.96
4.5	2.15	2.15	0.86	0.86
5.0	2.10	2.10	0.84	0.84
5.5	2.00	2.00	0.80	0.80
6.0	1.90	1.90	0.76	0.76

Source: Hayami-Peterson, *ibid*, Kibler and author's calculations.

On the bases of the data on 1973 costs of national probability survey, it was found that all items total probability survey cost \$6.80 million as against \$2.74 million for crop acreage total probability survey. In other words, crop acreage estimation was 40 percent in cost terms of total all item probability survey. We therefore assumed that 40 percent of all item survey costs for the 1967 data amounted to costs for crop acreage as shown in Table 1.

Inflation and other cost determinants have raised costs by an average of 9.3 percent per annum between 1967 and 1973. This means the cost index with a base of 1967 was 165.1 in 1973. Extrapolating the 1967 figures accordingly by increases of 65.1 percent yields the data shown in Table 2.

Table 2. Error - Cost Level Relationships
(Data are costs in millions of 1973 \$)

Error levels (percent)	Total probability sample survey		Crop acreage survey	
	Area sample	Multiple frame sample	Area sample	Multiple frame sample
0.0	102.30	72.93	41.17	29.17
0.5	29.54	22.46	11.35	8.98
1.0	12.54	12.06	5.25	4.82
1.5	9.57	9.24	3.85	3.70
2.0	6.80	6.80	2.74	2.74
2.5	6.20	6.20	2.48	2.48
3.0	5.61	5.61	2.24	2.24
3.5	4.79	4.79	1.92	1.92
4.0	3.96	3.96	1.58	1.58
4.5	3.55	3.55	1.42	1.42
5.0	3.47	3.47	1.39	1.39
5.5	3.30	3.30	1.32	1.32
6.0	3.14	3.14	1.26	1.26

Source: Author's calculations

In Table 3 the data have been rearranged to indicate error levels by cost level.

Table 3. Crop Acreage Estimation: Cost - Error Relationships

Costs (Million 1973 \$)	Errors (percent)
1.26	6.0
1.32	5.5
1.39	5.0
1.42	4.5
1.58	4.0
1.92	3.5
2.24	3.0
2.48	2.5
2.74	2.0
3.70	1.5
4.82	1.0
8.98	0.5
29.17	0.0

Source: Table 2